

Port of Seattle Submittal  
for RFA 6-26-92

WA 2917

11-22-89

7a

Converse GES

Geoenvironmental Services



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PRELIMINARY HYDROGEOLOGIC ASSESSMENT REPORT

Terminal 91 Facility

Seattle, Washington

Prepared for:

Pacific Northern Oil

Converse Project No. 89-45527-01

November 22, 1989

USEPA RCRA



3012557



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November 22, 1989

89-45527-01

Pacific Northern Oil  
North Tower - Suite 200  
100 West Harrison Plaza  
Seattle, Washington 98119

Attention: Mr. George Markwood

Subject: Transmittal of Preliminary Hydrogeologic Assessment Report

Gentlemen:

Our preliminary hydrogeologic assessment report accompanies this letter. The report presents results of our groundwater sampling and gradient analysis and product recovery test. Recommendations are provided for the location of four proposed monitoring wells. We have enjoyed working on this report for you and look forward to completion of the Phase I Remedial Investigation.

Sincerely,

CONVERSE CONSULTANTS NW

*Erick W. Miller*

Erick W. Miller  
Hydrogeologist

*Ronald E. Guest*

Ronald E. Guest, P.E.  
Executive Vice President

EWM/REG/kpp

## Executive Summary

This report presents the results of our preliminary hydrogeologic assessment at Pacific Northern Oil's Terminal 91 facility. One round of groundwater samples were obtained from the four existing wells at the site and analyzed for total petroleum hydrocarbons (TPH). Groundwater level measurements were taken throughout a 24-hour period to determine the tidal influence on groundwater gradient. Groundwater and chemical gradient data were then used to site four additional monitoring wells. In addition, a product recovery test was performed to develop preliminary design criteria for a product extraction system.

Results indicate only one monitoring well, MW-3, exceeds the Washington State Department of Ecology cleanup guideline for TPH in groundwater of 15 parts per million (ppm) for spills from underground petroleum tanks. Monitoring well MW-3 had a TPH concentration of 730 ppm. This well had approximately 3-1/4 inches floating product at the time of sampling. No other wells had measurable floating product. Monitoring well MW-2 had a concentration of 15 ppm, equal to Ecology cleanup guideline.

The water level measurements indicate a predominantly southeasterly groundwater flow direction. A maximum change of 25 degrees in the groundwater flow direction occurred between high and low tides. The maximum water level change was 0.24 foot.

Four additional monitoring wells are recommended to define the extent of floating and dissolved product. Two proposed wells will be located adjacent to the bulkhead in the downgradient direction. These wells will be used to determine the extent of dissolved and floating product in the downgradient direction. A third well is located at the northwest corner of the site and will be used to determine the upgradient extent of contamination. A fourth well is proposed at the northeast corner of the site. The location of this well is subject to change pending results of ongoing pressure testing.



The product recovery test indicates a relatively slow rate of product recovery in MW-3. Using the existing 2-inch diameter monitoring well for product extraction, approximately 2 gallons/day of product could be obtained. A larger diameter recovery well or sump is recommended pending results of the four proposed wells. Periodic hand bailing of free product is recommended as an interim product removal measure.

### Introduction

This report presents the results of our preliminary hydrogeologic assessment for the petroleum spill at Port of Seattle Terminal 91. Pacific Northern Oil operates a ship refueling facility at Terminal 91. Terminal 91 is located at the north end of Elliott Bay at the Magnolia Bridge crossing, as shown in Figure 1. This report includes a summary of our investigative methods, results of groundwater flow analysis, product recovery test, and analytical testing. Laboratory reported analytical results and results of the product recovery test are included in Appendices A and B, respectively. The Health and Safety Plan under which all field work was performed is in Appendix C. These services are provided in accordance with our October 12, 1989 proposal.

The purpose of this investigation was to determine chemical gradients, groundwater flow direction and tidal influence on groundwater flow, and to use this data to site four additional monitoring wells. The additional monitoring wells will be used to determine the extent of dissolved and floating product.

### Methods of Investigation

On October 30, 1989 the four existing 2-inch monitoring wells at Pacific Northern Oil's (PNOCO) Terminal 91 site were sampled. The monitoring well locations are shown on Figure 2. Samples from the monitoring wells were taken from the upper 2 feet of water in the wells, using a Teflon bailer. Prior to sampling, three to five casing volumes of water were



evacuated from each well to ensure fresh formation water at the time of sampling. Measurements of pH, specific conductance, and temperature were taken periodically during well purging to ensure that these parameters had stabilized prior to sampling. All purged water was decanted into a 55-gallon drum, which was labeled and stored on site. Samples were placed in an ice chest chilled with blue ice and delivered to Laucks Testing Laboratories, Inc. in Seattle for analysis of total petroleum hydrocarbons (TPH) using EPA method 418.1. Standard EPA chain-of-custody procedures were followed for all samples.

All sampling equipment was decontaminated between each well. The decontamination procedure consisted of a tap water andalconox wash, a tap water rinse, a methanol rinse and a final deionized water rinse.

Groundwater levels were measured throughout the duration of one tide cycle to determine if diurnal fluctuations in tide would have an impact on the direction and gradient of groundwater flow. A Terra-8 datalogger utilizing pressure transducers in the 0 to 5 psi range was programmed to take measurements of groundwater levels from monitoring wells MW-2, MW-3 and MW-6. After obtaining initial hand measurements of the static groundwater depth, the pressure transducer probes were lowered into the respective monitoring wells to a depth of approximately 5 feet below the water table. The duration of the groundwater level measurements was from Thursday, 11/09/89 11:23 a.m. until Friday, 11/10/89 2:04 p.m. Three high tides and two low tides occurred during the measurement period.

#### Tidal Response and Groundwater Flow Direction

Hydrographs of the static water level elevations collected from MW-2 and MW-6 are shown on Figure 3. The response of the groundwater level to the high tide on 11/9/89 at 1:09 p.m. and on 11/10/89 at 2:14 a.m. is shown by the peaks of the graph occurring at approximately 200 minutes

and 900 minutes, respectively. Likewise, the troughs of the plot occurring at approximately 550 minutes and 1200 minutes represent the groundwater levels during the low tide on 11/9/89 at 7:58 p.m. and on 11/10/89 at 7:43 a.m. The total net water level fluctuation was 0.23 foot for MW-6 and 0.24 foot for MW-2. The response of the groundwater level at the site is in phase with tidal fluctuations. In other words, the highest measured groundwater levels correspond to the time period of high tide and the lowest measured groundwater levels correspond to the time period of low tide.

The gradient inducing groundwater flow, using data collected during one tidal cycle from monitoring wells MW-2, MW-3 and MW-6, is shown on Figure 2. Table 1 lists static water level elevations used in Figure 2. The apparent direction of groundwater flow during the tidal cycle measured between November 9, 1989 and November 10, 1989 was predominantly southeast. A 25-degree directional change was observed for the measurements obtained on 11/9/89 at 6:00 p.m. The variation in direction could be caused by the major low tide event which occurred on 11/9/89 at 7:58 p.m. The 6:00 p.m. November 9 groundwater gradient direction is shown on Figure 2 by the arrow labeled number 4. This southeast direction of apparent groundwater flow is consistent with flow directions calculated with water level data collected on October 30, 1989, at the time of groundwater sampling.

TABLE 1  
STATIC WATER LEVEL ELEVATIONS (feet)

<u>Monitoring Well</u>	<u>11/9/89 11:30 a.m.</u>	<u>11/9/89 6:00 p.m.</u>	<u>11/10/89 8:00 a.m.</u>	<u>11/10/89 2:30 p.m.</u>
MW-2	8.86	8.83	8.84	8.98
MW-3	8.34	8.36	8.25	8.49
MW-6	8.72	8.84	8.76	8.85



### Analytical Results

Analytical results for TPH are listed in Table 2. Laboratory reported analytical results and chain-of-custody forms are included in Appendix A. In general, TPH concentrations increase from west to east. A clean-up goal of 15 parts per million (ppm) for total petroleum hydrocarbons in groundwater has been implemented by the Washington State Department of Ecology (Ecology) for spills from petroleum tanks. Monitoring well MW-3, which had a measurable floating product thickness of 3-1/4 inches on October 30, 1989, was the only well to exceed Ecology's cleanup goal, with a TPH concentration of 730 ppm. Monitoring well MW-2, located at the northeast corner of the site, had a TPH level of 15 ppm.

TABLE 2  
ANALYTICAL RESULTS

<u>Monitoring Well</u>	<u>TPH (ppm)</u>
MW-2	15
MW-3	730
MW-6	13
MW-11	7.4

### Product Recovery Test

On October 30, 1989, a product recovery test was performed on well MW-3. The purpose of the test was to estimate the rate of product inflow into the well to determine the feasibility of product extraction and to determine the true product thickness on the aquifer. Complete methodology and results of the bail test are presented in Appendix B. Results of the bail test indicate that the product will recover to approximately 75 percent of its initial thickness in one-half hour after bailing. Based on this recovery rate and a measured product thickness of a little over three inches, approximately 2 gallons of product/day could be obtained from this well.



The product thickness measured in wells is an apparent product thickness, which has been commonly accepted to be greater than the actual formation thickness. The apparent product thickness phenomenon is attributed to the specific gravity of product and to capillary effects. Product accumulates on the capillary fringe, which is saturated with water. The product will drain off the capillary fringe into the well casing, increasing product thickness and depressing the water level in the well. Appendix B presents the analysis of the bail test to determine the true product thickness. Analysis of the product bail test results indicate the true product thickness is less than a half-inch.

#### Well Location Recommendations

It is recommended that four additional monitoring wells be installed at Terminal 91 to determine the extent of free product and dissolved hydrocarbons in the groundwater.

Figure 4 shows the proposed locations of the new monitoring wells. These locations were chosen based on contaminant data and the hydrogeological conditions encountered at the site. The locations of the proposed monitoring wells may vary pending the results of the fuel line pressure testing.

The rationale for the proposed monitoring well locations is as follows:

- MW-101 To define the upgradient extent of contamination.
- MW-102 To define the extent of free product; the well may be used for product recovery during the remedial phase if free product is encountered. The well is located adjacent to the east retaining wall, which, based on results from soil borings installed by Hart Crowser, appears to be a barrier to contaminant migration. This retaining wall may be channeling product to the south.
- MW-103 To define the downgradient extent of the leading edge of the dissolved hydrocarbon plume or extent of free product. This well is also located adjacent to the east retaining wall.

MW-104 To define the upgradient extent of contamination to the northeast if the outcome of the fuel line pressure testing indicates the leak has occurred in the southern portion of the line. This well may be moved to investigate contamination in the leak area.

All four proposed monitoring wells will be drilled to approximately 15 feet, and 4-inch diameter PVC monitoring wells will be installed. The screens will be placed at a depth approximately 5 feet above and below the water table to intercept any free product that could be floating on the water table.

Soil samples will be taken at each boring at 2.5-foot depth intervals. Three soil samples from each boring will be selected for laboratory analyses based on field screening with an organic vapor detector (HNu), visual observations and depth to groundwater.

#### Preliminary Design Recommendations for Interim Product Removal

Effective design of a product extraction system will require definition of the extent of the free product lens. Results of the bail test indicate a relatively slow recovery rate for free product in monitoring well MW-3. This recovery rate could be enhanced by a larger diameter extraction well or sump. However, because the extent of the free product lens to the south is unknown, we recommend final remedial design of a product extraction system and recovery well installation be delayed until the four recommended monitoring wells are installed. In addition, results of line pressure testing currently being performed by PNOCO may provide useful information for siting the recovery well.

At this time, it is the opinion of Converse that an interim product extraction program consisting of hand-bailing product from monitoring well MW-3 be implemented. This program should consist of bailing out the free product and water from the upper two feet of the well on a daily basis.



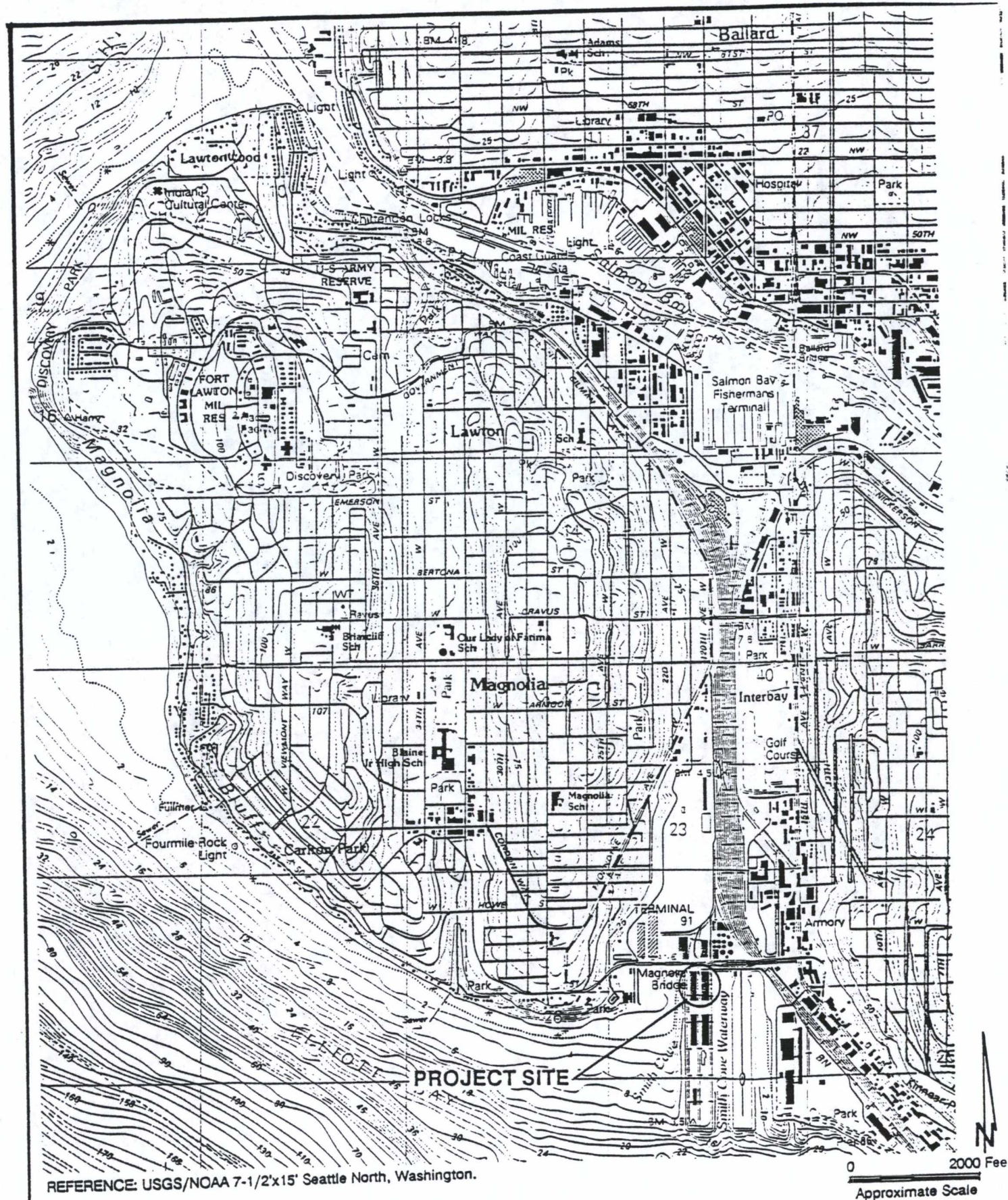
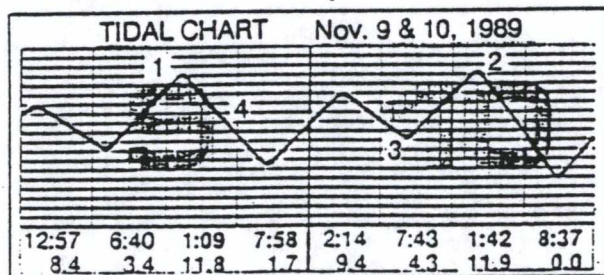
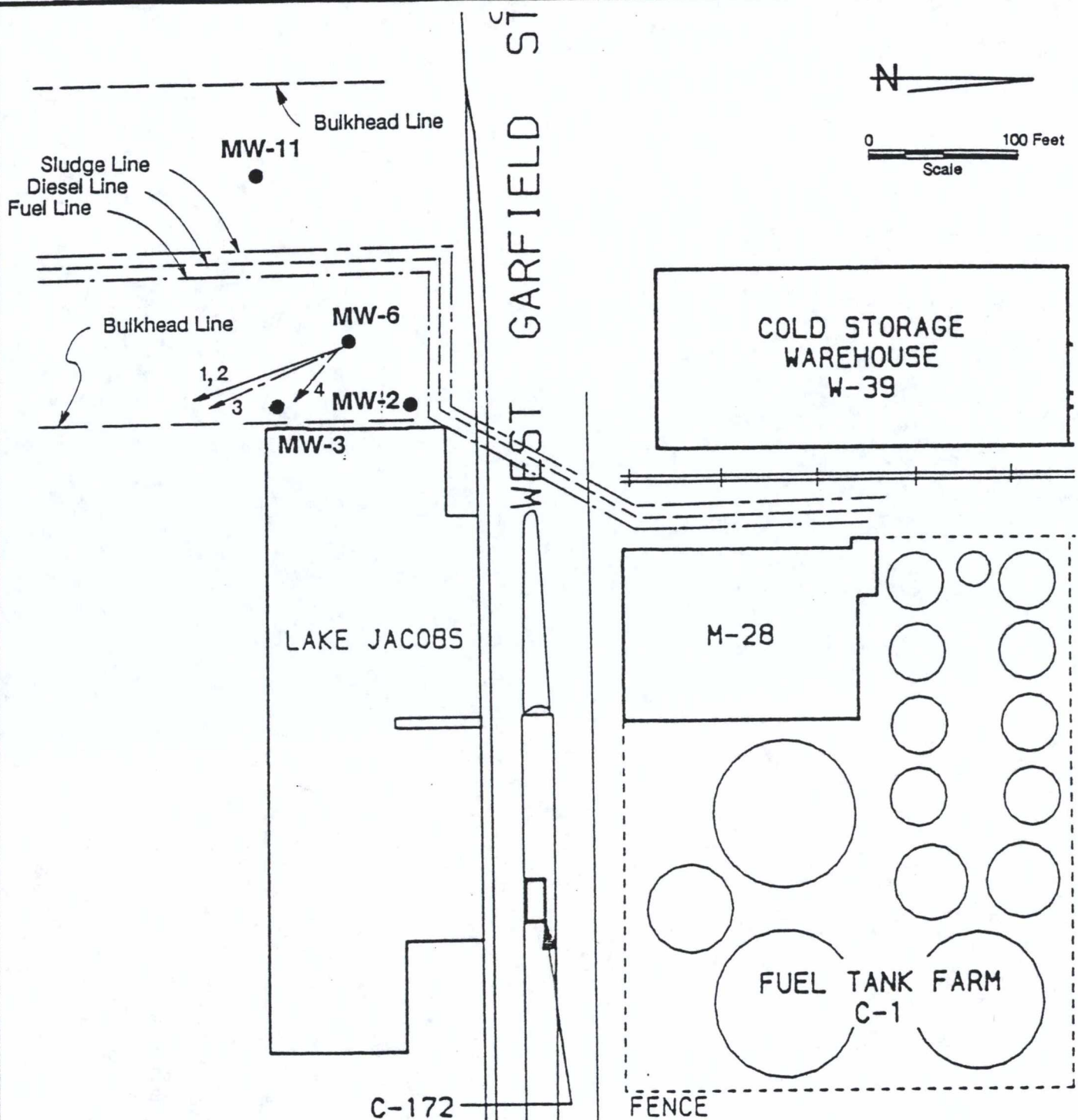


Figure No. 1  
PROJECT LOCATION MAP  
Pacific Northern Oil - Terminal 91







REFERENCE: Puget Sound Time-n-Tide 1989 Calendar.

LEGEND:

MW-6 • Groundwater monitoring well

Groundwater gradient

- 1 Nov. 9 11:30 a.m. high tide
- 2 Nov. 10 2:30 p.m. high tide
- 3 Nov. 10 8:00 a.m. low tide
- 4 Nov. 9 6:00 p.m. low tide

Figure No. 2  
GROUNDWATER FLOW DIRECTION - 1 TIDE CYCLE  
Pacific Northern Oil - Terminal 91



# PACIFIC NORTHERN OIL TERMINAL 91

GROUNDWATER LEVELS 1 TIDE CYCLE

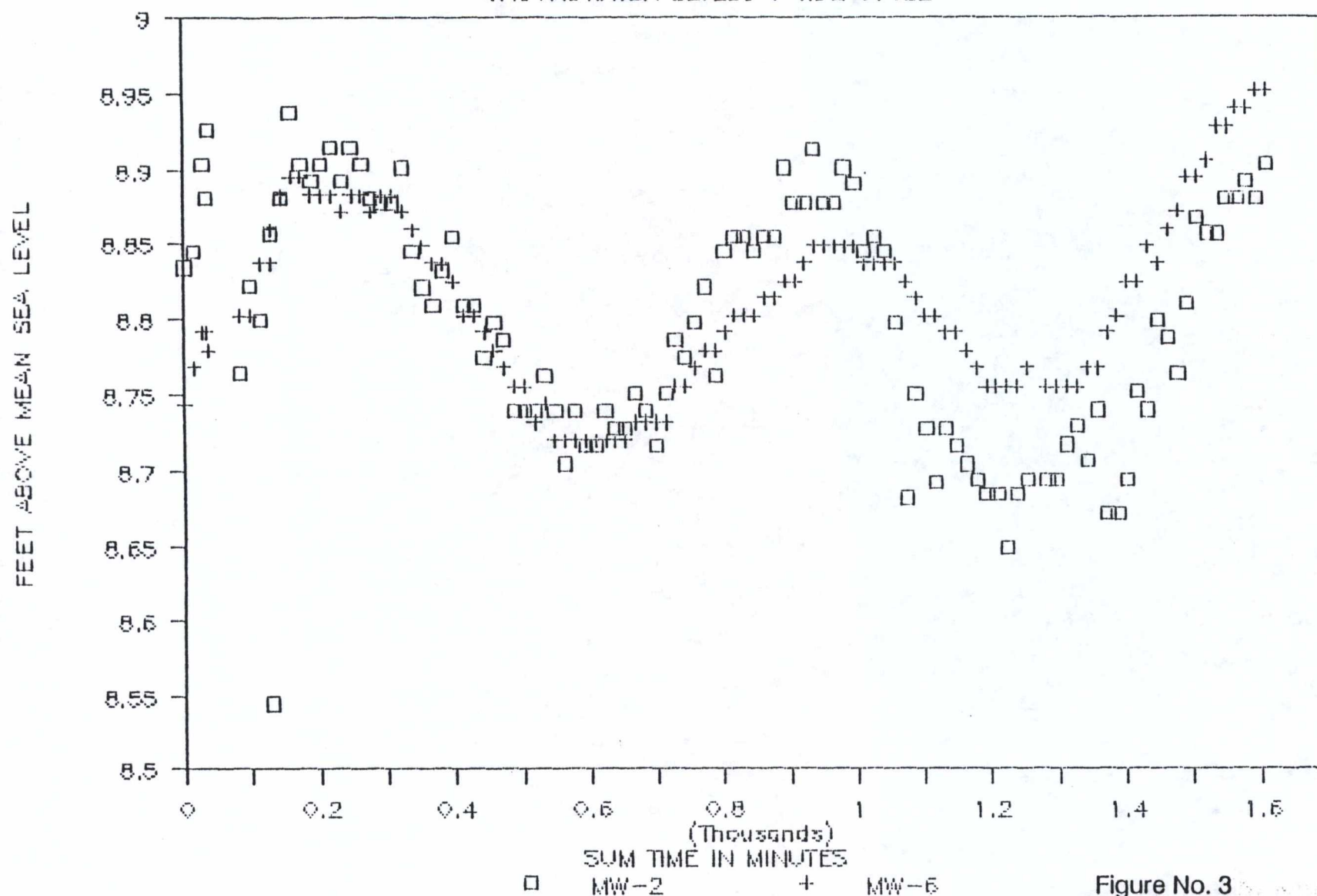
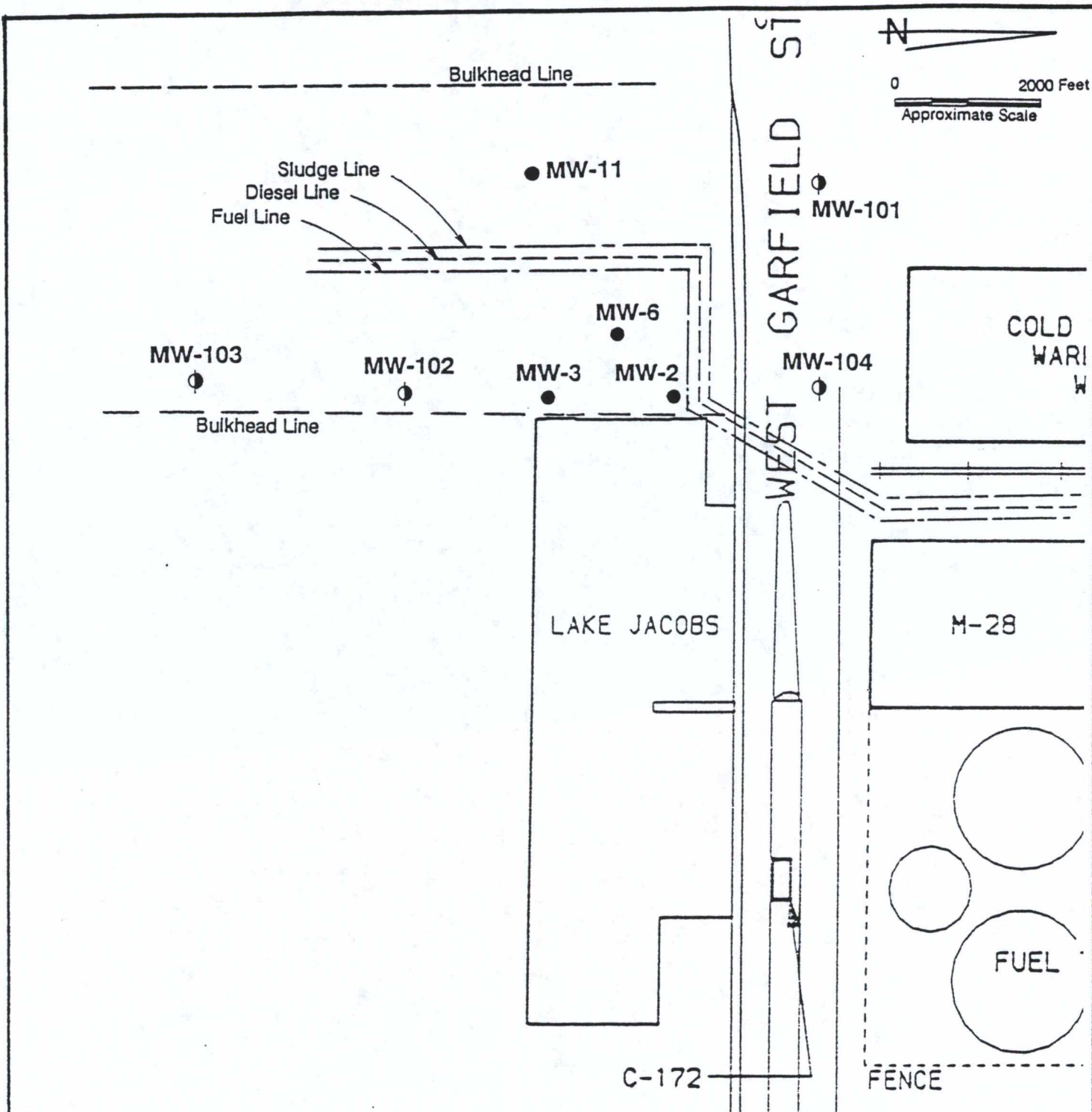


Figure No. 3  
GROUNDWATER LEVELS - 1 TIDE CYCLE  
Pacific Northern Oil - Terminal 91



LEGEND:

MW-102 ○ Proposed monitoring well

MW-6 ● Groundwater monitoring well

Figure No. 4  
PROPOSED WELL LOCATION MAP  
Pacific Northern Oil - Terminal 91





**APPENDIX A**

**LABORATORY REPORTED ANALYTICAL RESULTS  
and  
CHAIN-OF-CUSTODY FORMS**

# Laucks

## Testing Laboratories, Inc.

940 South Harney St., Seattle, Washington 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Converse Consultants NW  
3131 Elliott Ave West, #550  
Seattle, WA 98121

Date Received: 10/30/89  
Date Reported: 11/06/89  
Work Order: 89-10-233  
Category: 1184008

Attn: Erick Miller

Work ID: Pacific Northern  
P O # : Job No. 89-45527-02

Units	MW11 Southwest Corner 10/30/89 11:39	MW6 Center Well 10/30/89 12:20	MW2 North Well 10/30/89 12:56	MW3 Southeast Well 10/30/89 01:44
(Method EP 418.1) mg/L	7.4	13.	15.	730.

Certified By:

*J. M. Owens*

# Laucks

## Testing Laboratories, Inc.

940 South Harney St., Seattle, Washington 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

### REPORT ON WORK ORDER 8910233 PREPARATION BLANKS

Test : TPH (Method EP 418.1)  
Blank Name : B11010GWO1 Preparation Date: 11/01/89  
Conc Found : 0.500 U Control Limit : 1.000  
Units : mg/L

This blank and comments, if any, apply to the following sample(s):  
1-4

\* = outside control limits  
U = analyte not detected



DATE 10/30/89 PAGE 1 OF 1

[illegible]

## APPENDIX B

### PRODUCT RECOVERY TEST

On October 30, 1989, a product recovery test was performed on the 2-inch diameter, monitoring well MW-3 based on a method presented by Gruszczenski, 1987<sup>(1)</sup>. All product was bailed from the well using a Teflon bailer and decanted into a 55-gallon drum. The rising water/product interface and top of product level was measured using an Oil Recovery Systems (ORS) interface probe. Results of the test are depicted graphically in Figure B-1.

Because the apparent product thickness is greater than the actual product thickness in the formation, then at some time during recovery of the product in the well, the product thickness in the well bore will equal the true product thickness. This point is the inflection point of the water/product interface measurements in Figure B-1. Results of the test indicate a true product thickness of less than a half inch. Results of the test are shown schematically in the calculation brief presented in Figure B-2. The true product thickness will be useful for estimating quantities of fugitive petroleum when the extent of the product lens is known.

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(1) Gruszczenski, T.S., 1987, Determination of a realistic estimate of the actual formation production thickness using monitoring wells - a field bailout test, in Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Restoration.



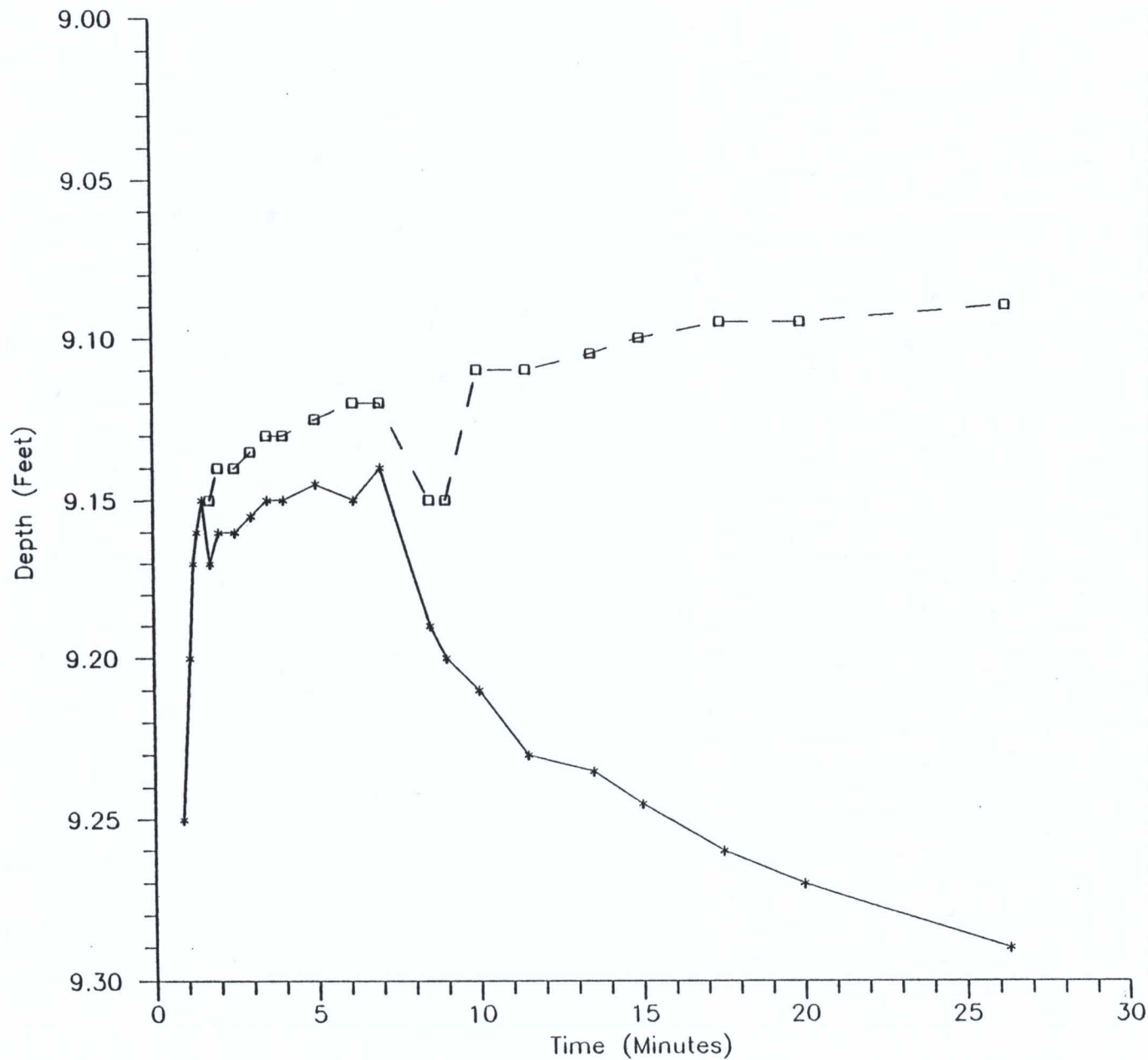
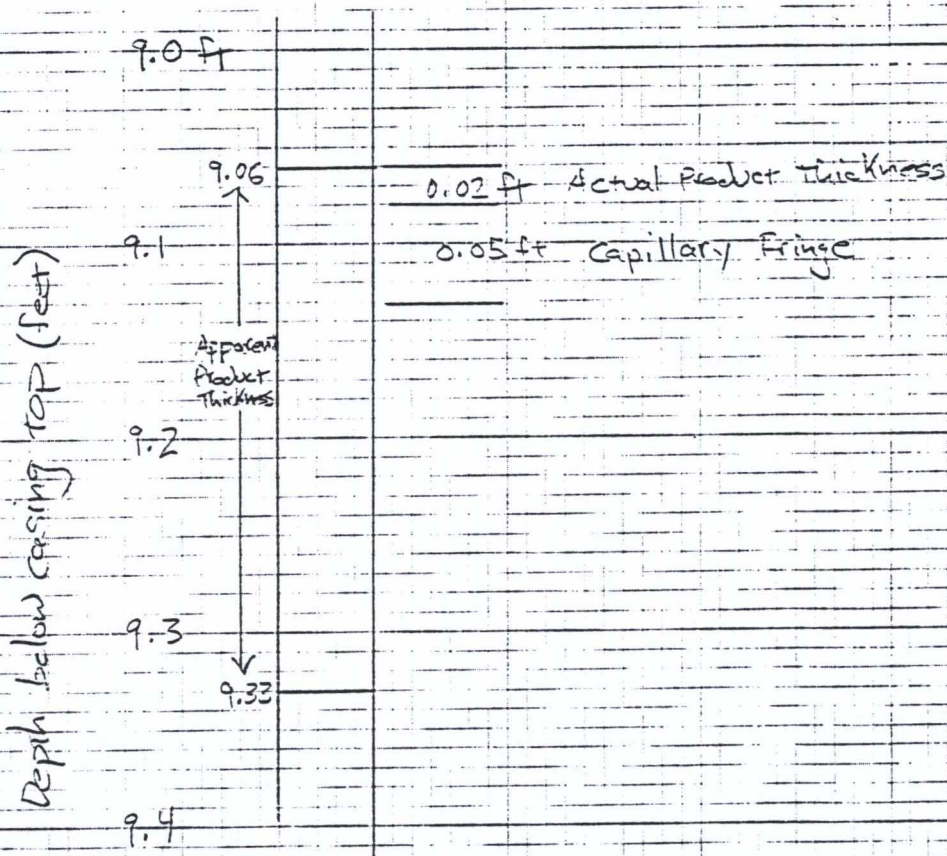


Figure No. B-1  
WATER/PRODUCT LEVELS VS. TIME  
Pacific Northern Oil - Terminal 91

## PNOCE Calculation Brief

	Product	Water	Water/Product Interface	Corrected Water Level
Inflection Point	9.12	9.14	0.02	9.13
Static	9.06	9.33	0.27	9.13



Monitor Well MW-3  
 Recovery Test Performed 10/30/89

Figure B-2



**Converse GES**

SIGNED \_\_\_\_\_  
 REG. NO. \_\_\_\_\_

SHEET  
NO.



APPENDIX C

HEALTH AND SAFETY PLAN

Converse GES  
HEALTH AND SAFETY PLAN

1.0 GENERAL INFORMATION

- 1.1 CLIENT: Pacific Northern Oil
- 1.2 PROJECT NO: 89-45527-02
- 1.3 PROJECT MANAGER: Erick W. Miller / Converse GES
- 1.4 SITE NAME: Marine Facilities, Terminal 91 (South)
- 1.5 SITE LOCATION: Port of Seattle, Terminal 91 (see Figure C-1).
- 1.6 PURPOSE OF FIELD VISIT(S): Complete four borings as monitoring wells, each to 15-foot depths. Hollow-stem auger will be used and samples taken at 2.5-foot intervals. Samples will be analyzed for total petroleum hydrocarbons. Soil cuttings will be drummed and left on-site for disposal by Pacific Northern Oil. Groundwater sampling of eight monitoring wells will be performed following well installations.
- 1.7 DATE OF VISIT(S): To begin October 31, 1989.
- 1.8 BACKGROUND INFORMATION: Complete   X   Preliminary
- 1.9 INFORMATION AVAILABLE FROM: Erick W. Miller / Converse GES
- 1.10 OVERALL HAZARD SUMMARY: Serious        Moderate         
Low   X   Unknown

2.0 SITE CHARACTERISTICS

2.1 FACILITY DESCRIPTION:

Terminal 91 is part of the Port of Seattle, located at the north end of Elliott Bay in Seattle, Washington. The project site is south of West Garfield Street within a paved area. Lake Jacobs is located east of the project site.

2.1.1 Principal Disposal Method (type and location): N/A



## 2.2 FEATURES OF THE SITE (powerlines, gaslines, watermain, terrain, etc.):

Utilities are underground and will be located by Pacific Northern Oil. The site is located on fill adjacent to Puget Sound. It is anticipated that the security building or the Pacific Northern facility located northeast of the site will have running water.

## 2.3 STATUS (active, inactive, or unknown): Active.

## 2.4 HISTORY (worker or non-worker injury, complaints from public, previous agency action):

The area to be investigated is currently a paved storage yard used to store shipping freight. Sludge, diesel and fuel lines are buried below grade and run through the center and northern edge of the site. Observations during previous explorations reported silty to gravelly sand to a depth of 20 feet. Groundwater was encountered between 9 to 10 feet. A hydrocarbon mixture resembling diesel fuel was detected in soil samples collected from soil borings.

## 3.0 WASTE CHARACTERISTICS

### 3.1 WASTE TYPE(S) (that could be encountered):

Liquid X Solid X Sludge        Gas       

### 3.2 CHARACTERISTICS

Corrosive ? Ignitable X Radioactive        Volatile X  
Toxic ? Reactive ? Other       

## 4.0 HAZARD EVALUATION

### 4.1 OVERALL HAZARD LEVEL:

The overall hazard level is low. Since it is not possible to monitor for all types of hazardous materials, care must be taken when handling samples, drill cuttings, etc. If a metallic taste develops in the mouth or the eyes start to burn, quickly move to an upwind position and regroup to determine how to complete the job.

#### 4.2 CHEMICAL HAZARDS:

Hazards of diesel fuel are discussed below. General warning symptoms of the compound identified from Terminal 91 are provided.

Diesel Fuel Oil is a complex mixture of paraffinic, olefinic, naphthenic and aromatic hydrocarbons. Inhalation will cause dizziness, headache, nausea, vomiting, and loss of coordination. In general, this type of product is not sufficiently volatile to constitute an acute inhalation hazard except when emitted as a mist or aerosol. Dermal contact will result in a rash of acne or spots.

- Expected Levels: levels are not expected to exceed low ppb in air
- Exposure Routes: inhalation, skin absorption, ingestion
- Exposure Limits (air): OSHA & ACGIH TWA = 5 mg/m<sup>3</sup>

In general, if headache, eye irritation, fatigue, metallic taste in the mouth, etc. develops while drilling, leave the area immediately and call the project manager for instructions.

#### 4.3 PHYSICAL HAZARDS:

Physical hazards are those associated with drilling. Care should be taken not to wear loose clothing or jewelry when working near the drill rig. Noise is a hazard when drilling. Hearing protection should be used. Heavy equipment presents many opportunities for traumatic injury.

The potential for fire and explosion is present when drilling through an area of unknown buried material. Spark sources such as matches and lighters should not be carried on personnel. Electrical wiring should be inspected for integrity.

When first drilling through the paving, asphalt may splatter.

#### 4.4 HAZARDS POSED BY SITE ACTIVITIES:

Hazards presented by activities include the potential for fire, explosion, chemical exposure and trauma.

#### 4.5 HAZARDS POSED BY CHEMICAL SUBSTANCES:

In accordance with Washington State regulations for hazard communication, Material Safety Data Sheets (MSDS) are provided for the following chemicals:

- o diesel fuel oil No. 2-D



## 5.0 PROCEDURES

### 5.1 SITE ORGANIZATION:

Map/sketch attached yes Site secure yes  
Perimeter Identified NA  
Zone(s) of Contamination Identified NA

### 5.2 SITE PERSONNEL:

#### Team Organization:

<u>Team Members</u>	<u>Responsibility</u>	<u>40-hour Health &amp; Safety Training</u>
Mark Shaffer	Associate Geologist	
Erick Miller	Team Leader / Geologist	X
Dave Yonemitsu	Project Geologist	X
Ken Howard	Technician	X
John Strunk	Geologist	X
Rich Larson	Geologist	

#### Drillers

At least one team member is currently certified by the American Red Cross, or equivalent, in both first aid and CPR.

### 5.3 LEVEL OF PROTECTION

A      B      C X D X

Level D consists of:

- o Steel toe neoprene boots (meets ANSI Z41-1983)
- o Tyvek coveralls
- o Splash protection if conditions warrant its use
- o Chemically resistance outer gloves (Tri-Ionic, viton if contact with oily soils is necessary)
- o Surgical inner gloves
- o Hard hat
- o Safety glasses - not required if a faceshield is worn on the hardhat
- o Hearing protection - optional

Tape boots and gloves to coveralls if there is a potential for liquids to contact work clothing.

Level C add:

Full-face APR with organic vapor/acid gas/particular cartridges. Only respirators that the wearer has passed a fit test with may be worn. Only MSHA/NIOSH approved respirators and cartridges may be worn.

#### 5.4 SAFETY EQUIPMENT AND MATERIALS:

First aid kit, eye wash (can be clean water in a squeeze bottle), clean water, paper cups, wind direction indicator, 20-pound ABC fire extinguisher.

#### 5.5 MONITORING EQUIPMENT AND PROCEDURES:

Carefully inspect each piece of monitoring equipment prior to work startup. Failure of any of the equipment listed below to work properly must be reported to the Project Manager immediately. Failure of monitoring equipment is reason to shut down work until functional equipment is obtained.

##### 5.5.1 Gastec Explosimeter/O2 meter (model 1314) or Gas-Point (model H) Combustible Gas Indicator

Calibrate prior to each day's activities, according to manufacturer's instructions. Record calibration in the field log book. Set O2 level in a "clean" area. Recharge at the end of each day. Monitor continuously during drilling and record measured levels in the log book every 30 minutes.

- Action Levels:
- o At 20 percent of the LEL, measures must be taken to reduce the flammability of the work zone or work must cease until the LEL has dropped below this level.
  - o At least 19.5 percent O2 must be present to work without the use of supplied air (SCBA).
  - o At greater than 21 percent O2 work must cease as you are in the flammable range for O2.

##### 5.5.2 HNU with 10.2 eV lamp

Calibrate prior to each day's activities, according to manufacturer's instructions. Record calibration in the log book. Recalibrate after cleaning the lamp or when background levels drift. Background readings must be taken in a "clean" area and recorded in the log book. This instrument is sensitive to humidity and may require periodic lamp cleaning if it is humid or wet. In the rain or on cold misty mornings, the instrument should be placed in a warm car to dry out the lamp if drifting occurs. Monitor continuously in the breathing zone and record measured levels in the log book every 30 minutes.

- Action Levels:
- o Continuous readings above background at all in the breathing zone require an upgrade to Level C. If an upgrade to Level C is done based on instrument readings, the SSC must be aware of taste or odors inside the mask. If these are noticed, level the site immediately and call the project manager.
  - o If readings rise above 10 ppm consistently in the breathing zone, evacuate the area.



## 5.6 SITE ENTRY PROCEDURES:

- o Check in with personnel at the security building prior to starting work.
- o Go over the safety plan with the drillers. Inform them of the potential hazards of the site and the procedures to reduce or eliminate exposure. Inform them of emergency procedures and plans. Record the time and duration of this briefing in the field log book and the names of all present.
- o Locate nearest telephone that is available for your use.
- o Post emergency telephone numbers and route to hospital in the vehicle.
- o Designate at least one vehicle for emergency use and park it in a "get-away" position.
- o Determine wind and position personnel upwind.
- o Set up an exclusion zone to keep Navy personnel outside of the work zone.
- o Set up decontamination station prior to beginning work.

## 5.7 WORK LIMITATIONS (time of day, etc.)

- o No eating, drinking, or smoking onsite. A complete decon must be performed prior to these activities.
- o No contact lenses to be worn onsite.
- o No facial hair that would interfere with respirator fit.
- o Buddy system at all times.
- o Cover drill cuttings nightly.

## 5.8 DECONTAMINATION PROCEDURES

### 5.8.1 Personnel

At a minimum personnel decontamination for BREAKS on the site consist of:

- o Wash outer gloves inalconox and water, rinse in clean water. Boots should be scrubbed around the bottom edges and soles.
- o Remove outer gloves.
- o Remove tyveks, rolling coveralls from the inside to the outside.
- o Remove inner gloves and place in plastic bag for disposal.
- o Wash hands and face in clean water and hand soap prior to drinking.

At a minimum personnel decontamination for LUNCH OR LEAVING THE SITE consists of:

- o Wash boots inalconox and water (1 tablespoonalconox per gallon of water), using the boot brush. Make sure all material is removed from the soles.
- o While standing in the boot wash area, wash off splash protection with brush andalconox water, if worn.
- o Rinse boots in clean water, rinse down splash protection, if worn.
- o Wash outer gloves inalconox and water, rinse in clean water.

- o Remove splash protection, boots then gloves.
- o Put on street shoes.
- o Wash hands and face in clean water and hand soap prior to lunch.
- o If a RESPIRATOR is being worn, remove it after removing outer gloves and prior to removing inner gloves. Place it on a clean (plastic covered area) surface with the lens up. After lunch is over, put on respirator after replacing inner gloves, but prior to replacing outer gloves.

#### 5.8.2 Sampling Equipment

As per the work plan.

#### 5.8.3 Samples

As per the work plan.

#### 5.8.4 Heavy Equipment

As per the work plan. The drill rig should be washed (high pressure hose or steam cleaned) prior to leaving the base.

### 5.9 DISPOSAL OF MATERIALS GENERATED ONSITE

All health and safety disposables will be bagged in plastic garbage bags and disposed of onsite. All drill cuttings will be drummed and left onsite.

## 6.0 CONTINGENCY PLAN

### 6.1 PERSONAL TRAUMA INJURY:

If a personal trauma injury (NOT CHEMICAL EXPOSURE) occurs in a non-life threatening situation (neither the victim's life or the rescuer's life is in jeopardy), take the following steps:

#### 6.1.1 If the victim is CONSCIOUS:

- o Prevent further injury and initiate first aid.
- o If the injury is not suspected to be serious (you must use judgment) and the victim is able to move, relocate the victim to Security Gate and obtain medical help.
- o If the injury IS SERIOUS, do not move the victim. Try to stabilize the victim. Have someone get additional help by calling 911.



6.1.2 If the victim is UNCONSCIOUS:

- o Do not attempt to move the victim. Check for breathing and heart beat. Render appropriate first aid (CPR or mouth-to-mouth) if victim is not breathing or heart beat cannot be detected.
- o Have someone go call 911, and do not stop rendering aid until medical help arrives.

Provide the following information:

1. Give them your location:
2. Tell them the victim is unconscious, not breathing, etc.

After the medical needs of the victim are taken care of, notify the Project Manager (see section 6.6 for numbers) of the situation. Prepare an incident report by answering the questions listed on the attached form, INCIDENT REPORT. Whoever witnessed the accident is responsible for its completion. This should become part of the project file. Workman's Compensation requires submittal of claims within 48 hours of an accident.

6.2 CHEMICAL RELEASE OR POTENTIAL EXPOSURE

If an accident involves a chemical release or potential exposure it should be treated as a potentially life-threatening situation and the following steps should be taken:

- o Immediately obtain help by calling 911 from a phone. Never attempt to rescue an individual or stop a chemical release by yourself in a potentially life-threatening situation. Call 911 and ask for the fire department and a medical rescue. Provide the following information:
  1. Give them your location:
  2. Tell them the result of the accident, for example, a person is down from chemical exposure, drilling has released a pocket of gas, etc.
- o Direct the emergency crews to the scene of the accident and inform them of the chemicals that may be present on the victim.

After arranging for emergency help, notify the Project Manager. Prepare an incident report by answering the questions listed on the attached form, INCIDENT REPORT. Whoever witnessed the accident is responsible for its completion and submittal.

### 6.3 EXPLOSION OR FIRE:

#### 6.3.1 If an EXPLOSION occurs take the following steps:

- o EVACUATE the area immediately.
- o Call 911 and notify the fire department of the situation.
- o Take a head count of all personnel upon relocation. If all personnel cannot be located, inform the security office. Do not attempt to go back and look for missing personnel yourself. Inform the emergency group (fire department, etc.) of the situation.
- o Notify the Project Manager.
- o Do not return to work. An evaluation of the conditions that led up to the explosion must occur. At no time should anyone return to the site until it can be determined what caused the explosion to occur, why monitoring equipment did not warn of an impending explosion and what can be done about the safety of future work in the area of the explosion.

#### 6.3.2 If a SURFACE FIRE occurs:

- o If the fire is small and can be contained with the use of the fire extinguisher, do so. If not, evacuate the area and call 911 to have the fire department take care of the situation.

### 6.4 LOCAL EMERGENCY INFORMATION

Ambulance: 911

Hospitals: 911

Poison Control Center: 1-800-732-6985

Sheriff/Police: 911

Fire: 911

### 6.5 EMERGENCY ROUTES:

See Figure C-1, attached.



#### 6.6 EMERGENCY CONTACTS:

- o Converse Project Manager  
Name: Erick W. Miller  
Phone: (206) 285-5200 (office)
- o Occupational Physician  
Name: Virginia Mason Occupational Medicine  
Phone: 223-6949
- o Occupational Physician (drillers)  
Name:  
Phone:

Team members under above physicians care:

- o Client Contact  
Name: George Markwood  
Phone: 282-6574

## 7.0 PLAN APPROVAL

This site safety plan has been written for the use of Converse GES and its subcontractors. Converse GES claims no responsibility for its use by others. The plan is written for the specific site conditions, purposes, dates and personnel specified and must be amended if these conditions change.

This plan has been prepared by HEALTH/SCIENCES Consulting from information provided by Converse GES. The plan was amended by Converse GES for the current phase of work. Use of this plan does not ensure the safety of personnel onsite. Its purpose is to provide safety guidance only. No claims can be made as a result of injuries from unsafe acts or unplanned events.

PLAN PREPARED BY: Donna LaBar  
HEALTH/SCIENCES

DATE: May 15, 1989

PLAN AMENDED BY: John Strunk  
CONVERSE GES  
November 9, 1989

PLAN APPROVAL:

Attachments:

- o Figure C-1
- o MSDS for diesel fuel oil

Distribution of approved plan:

- o Project Manager (responsible for distribution to team members and client)



## REFERENCES

Hawley's Condensed Chemical Dictionary, 1987, 11th ed.: Van Nostrand Reinhold Company, New York.

Sax, I.N., 1984, Dangerous Properties of Industrial Materials: Van Nostrand Reinhold Company, New York.

Respirator Selection Guide, 1988, 3M.

Material Safety Data Sheets Collection, October 1987, Genium Publishing Corporation, Schenectady, New York.

GENIUM PUBLISHING CORPORATION  
1145 CATALYN STREET  
SCHENECTADY, NY 12303-1836 USA  
(518) 377-8855



DIESEL FUEL OIL NO. 2-D

Date October 1981

MATERIAL NAME: DIESEL FUEL OIL NO. 2-D  
DESCRIPTION: Mixture of petroleum hydrocarbons; a distillate oil of low sulfur content  
OTHER DESIGNATIONS: ASTM D975, CAS # 068 476 346  
MANUFACTURER: Available from many suppliers

2

## HAZARD DATA

Diesel Fuel Oil No. 2-D

Complex mixture of paraffinic, olefinic, naphthenic and aromatic hydrocarbons\*\*

Sulfur content

Benzene\*\*\*

\*Current OSHA standard and ACGIH (1981) TLV

\*\*Diesel fuels tend to be low in aromatics and high in paraffinics. A min. Cetane No. of 40 is required (ASTM D613).

\*\*\*A low benzene level reduces carcinogenic risk.

Fuel oils can be exempted under the benzene standard  
(29 CFR 1910.1028)

>95

 $\leq 0.5$ 

<100 ppm

8-hr TWA  $5\text{mg}/\text{m}^3$ \*  
(mineral oil mist)

Boiling point range, deg F, -----	Ca 340-675	Specific gravity (H <sub>2</sub> O=1) ----	<0.86
Solubility in water -----	negligible	Cloud point (wax), deg C ---	Ca 0
Viscosity at 40 C, cSt -----	1.9-4.1		

Appearance and Odor: Clear, bright liquid with a mild petroleum odor.

LOWER

## UPPER

Flash Point and Method

Autoignition Temp.

### Flammability Limits In Air

125F min (PM)

>500F

% by volume

0.6

7.5

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray. Use a water spray to cool fire exposed containers. Use a smothering technique for extinguishing fire of this combustible liquid. Do not use a forced water stream directly on oil fire as this will only scatter the fire. Material is a OSHA Class II combustible liquid. Firefighters should wear self-contained breathing apparatus and full protective clothing.

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. Incompatible with strong oxidizing agents; heating greatly increases fire hazard. Thermal -oxidative degradation may yield various hydrocarbons and hydrocarbon derivatives (partial oxidation products),  $\text{CO}_2$  and  $\text{CO}$  and  $\text{SO}_2$ .



## SECTION VI. HEALTH HAZARD INFORMATION

TLV 5 mg/m<sup>3</sup> oil (mist) (See Sect II)

Inhalation of excessive concentrations of vapor or mist can be irritating to the respiratory passages and can cause the following symptoms: headache, dizziness, nausea, vomiting, and loss of coordination. Prolonged or repeated skin contact may cause irritation of the hair follicles and block the sebaceous glands. This produces a rash of acne pimples and spots, usually on the arms and legs. (Good personal hygiene will prevent this).

Chemical pneumonitis may result when ingestion occurs and oil is aspirated in the lungs.

FIRST AID:

Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.

Skin Contact: Remove contaminated clothing. Wipe excess oil off with a dry cloth. Wash affected area well with soap and water.

Inhalation: Remove to fresh air. Restore and/or support breathing as required.

Ingestion: Do not induce vomiting.

Seek medical assistance for further treatment, observation and support.

## SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of leaks or spills. Remove sources of heat or ignition.

Provide adequate ventilation. Clean-up personnel to use protection against liquid contact and vapor or mist inhalation. Contain spill by diking. Small spills can be contained by using absorbents, such as rags, straw, polyurethane foam, activated carbon, and sand. Clean up spills promptly to reduce fire or vapor hazards.

DISPOSAL: May be disposed of by a licensed waste disposal company, or by controlled incineration or burial in an approved landfill.

Follow Federal, State and Local regulations. Report large oil spills.

## SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide adequate ventilation where operating conditions (heating or spraying) may create excessive vapors or mists. Use explosion-proof equipment. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter & vapor respirator when vapor/mist concentrations are high. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist conc. may occur. Additional suitable protective clothing may be required depending on working conditions. An eye-wash fountain and washing facilities to be readily available near handling and use areas.

Launder soiled or contaminated clothing before reuse (at least weekly laundering of work clothes is recommended).

## SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from sources or open flame, heat, strong oxidizing agents, and ignition. Protect containers from physical damage. Use non sparking tools and explosion-proof electrical equipment. Prevent static electric sparks.

Avoid prolonged skin contact and breathing of vapors or mists.

No smoking in areas of use. Follow good hygienic practice in the use of this material.

Do not wear oil contaminated clothing. Do not put oily rags into pockets. Wash exposed skin areas several times a day with soap and warm water when working with this material.

DOT Classification: COMBUSTIBLE LIQUID

DATA SOURCE(S) CODE: 1,6,7,12

APPROVALS: MIS  
CRD

Industrial Hygiene  
and Safety

MEDICAL REVIEW: 21 October 1981

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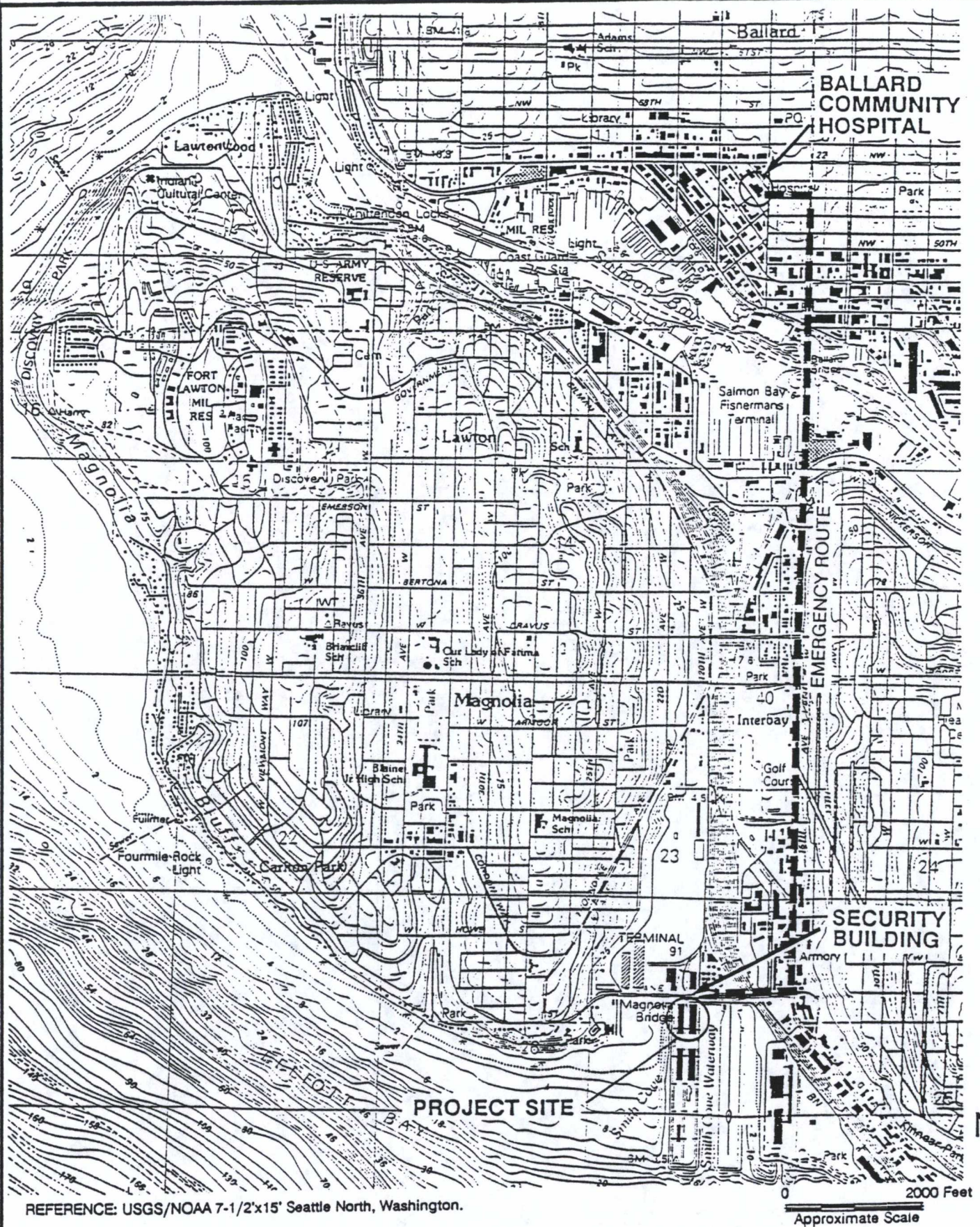


Figure No. C-1  
 LOCATION OF MEDICAL EMERGENCY SERVICES  
 Pacific Northern Oil - Terminal 91

